

**COPY OF CHIDAMBARAM U.S.**  
**PROVISIONAL APPLICATION NO. 60/482,573**  
(6 Unnumbered Pages)

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## PATENT DISCLOSURE FORM

DOCKET NO. TI-(to be filled in by Patent Activity)

IF ELECTRONICALLY TRANSMITTED, PROCESSING OF YOUR  
DISCLOSURE CANNOT BE COMPLETED WITHOUT A  
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NOV 22 2005

1. Please suggest a descriptive title for your invention:

Carbon doped Si in a recess next to MDD to create strain in the channel

2. This invention supports strategy: (check 1 or more)

- |                                     |                         |                          |                          |
|-------------------------------------|-------------------------|--------------------------|--------------------------|
| <input type="checkbox"/>            | DLP                     | <input type="checkbox"/> | DSPS                     |
| <input type="checkbox"/>            | Materials               | <input type="checkbox"/> | Wireless                 |
| <input checked="" type="checkbox"/> | Fab/Processes           | <input type="checkbox"/> | Video                    |
| <input type="checkbox"/>            | Assembly/Test/Packaging | <input type="checkbox"/> | Set Top                  |
| <input type="checkbox"/>            | Other                   | <input type="checkbox"/> | Application Specific     |
|                                     |                         | <input type="checkbox"/> | Remote/Access/Networking |
|                                     |                         | <input type="checkbox"/> | Emerging Markets         |
|                                     |                         | <input type="checkbox"/> | Mixed Signal & Logic     |
|                                     |                         | <input type="checkbox"/> | Mass Storage             |
|                                     |                         | <input type="checkbox"/> | Other                    |

3. What is the problem solved by your invention?

impart tensile strain in the channel by a silicon carbon epi layer.

4. What is your solution to the problem?

deposit a strained epi layer in a recess next to the mdd offset or SD offset

5. When was your solution first conceptually or mentally complete?

Date: [REDACTED]

6. What is the first tangible evidence of such completion?

Date: [REDACTED]

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7. What is different about your solution, compared with other solutions to the same problem?

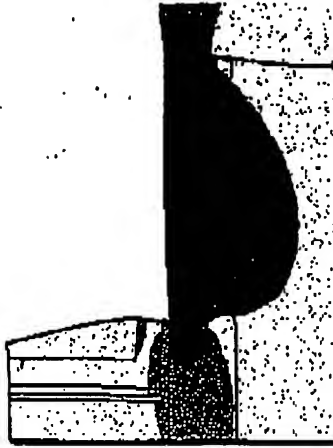
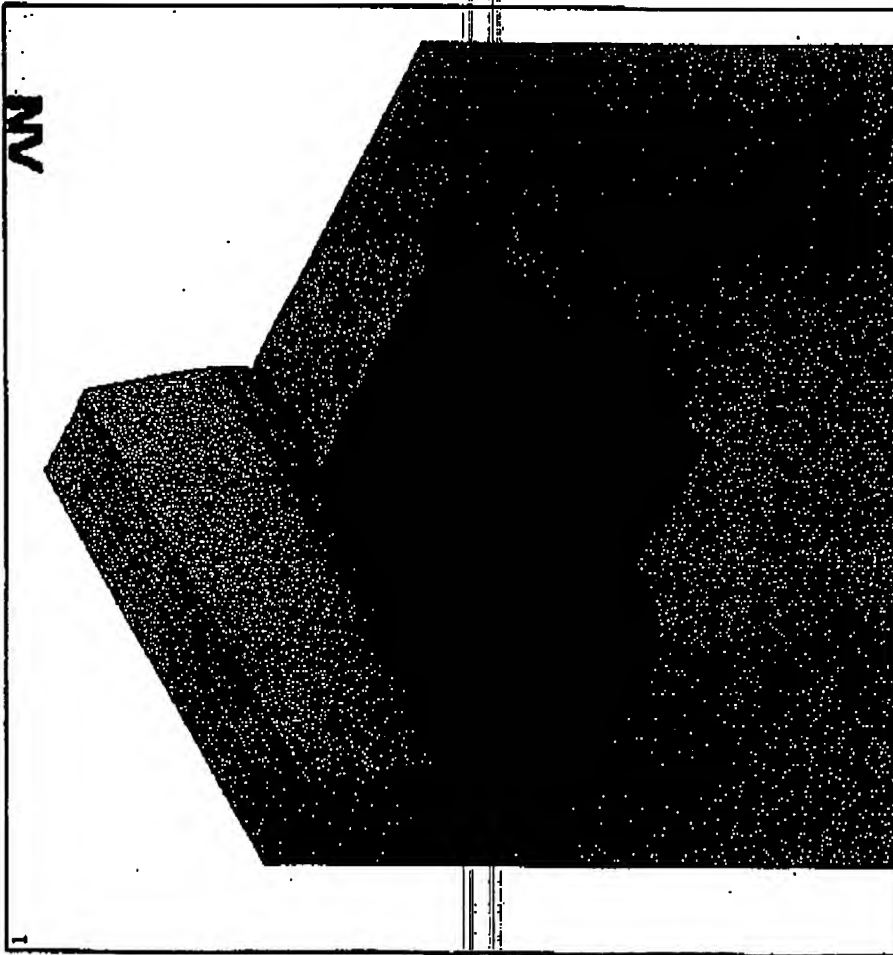
Ti can try to use it, the SiC layer if used in the channel results in Dit at interface and causes mobility degradation

8. What are the advantages of your solution?

The net interstitial content of the carbon layer not a big issue

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# Stress transmitted even from SD 1 GPA



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TEXAS INSTRUMENTS

# Effect of stress on Drive current

Relative changes in Idsat, Idlin, and Gm by the stress of 100MPa (tensile)  
From Hugo Wang

L	Ion	Idlin	Gm
0.100	1.8	1.7	1.7
0.105	2.0	2.0	2.0
0.110	1.9	1.7	1.8
0.115	2.0	2.0	1.9
0.120	2.1	2.1	2.1
0.125	2.1	2.1	2.1
0.130	2.1	2.1	2.2
1.000	3.4	3.5	3.6

TEXAS INSTRUMENTS

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## Stress From C

- Vegards law
  - Based on atomic radius of C and Si
  - Si 1% C would result in strain of 800 Mpa
  - $a_{SiC} = ((1-x)a_{Si} + x a_c) / a_{Si}$
  - $A_c = 0.077$  nm
  - $A_{Si} = 0.177$  nm
  - $A_{SiC} = 1.225$  nm
- LETI deposits C upto 4 %
  - Substitutionality a critical problem

TEXAS INSTRUMENTS

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## SiC in a recess

- **Claim**

- Develop tensile stress in Silicon by depositing Si (with C) in a recess in silicon at post offset or post sidewall spacer.
- C % from 1 – 4 %, high substitutionality

SiC in recess



- **Prior art**

- Strained Si on relaxed SiGe
  - Too complex to build 2-um of relaxed SiGe layer
- SiC on entire channel area (LETI)
  - When gate oxide formed on SiC C gets in the oxide and causes high DITs and degrades mobility.

INSTRUMENTS

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